IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of:	)	
	)	
Wu et al.	)	Group Art Unit: 2891
	)	
Serial No.: 10/672,778	)	Examiner: Smith, Bradley
	)	
Filed: September 26, 2003	)	Confirmation No.: 9717
	)	
For: **Atomic Layer Deposition (ALD) Method with Enhanced Deposition Rate**	)	TKHR Docket: 252016-3000 Top-Team: 0503-8501DUS
	)	

RESPONSE TO FINAL OFFICE ACTION

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Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

The FINAL Office Action mailed May 19, 2006 has been carefully considered. In further response thereto, please enter the following amendments and consider the following remarks.

AMENDMENTS

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A method for increasing the deposition rate of an atomic layer deposition method comprising：

a) positioning a substrate within an atomic layer deposition chamber;

b) flowing a first reactant gas into the atomic layer deposition chamber such that the first reactant gas is adsorbed onto the substrate;

c) flowing an inert gas into the atomic layer deposition chamber to substantially purge the interior of the chamber and leave remaining a residual portion of the first reactant gas; and

d) flowing a second reactant gas into the atomic layer deposition chamber, where the second reactant gas reacts with both the the first reactant gas adsorbed onto the substrate and the residual portion of the first reactant gas, thus forming a reacted material layer upon the substrate.

2. (Original) The method of claim 1 further comprising, after step d, flowing an inert gas into the atomic layer deposition chamber to substantially purge the interior of the reactor chamber except for a residual portion of the second reactant gas.

3-4. (Canceled)

5. (Previously presented) A method for forming a microelectronic layer comprising:

providing a substrate;

forming over the substrate a microelectronic layer while employing a deposition method which employs a separately pulsed introduction of a minimum of two reactant materials introduced into a reactor chamber maintained at a pressure of greater than about 500 mtorr;

where a second reactant material reacts with both a first reactant material adsorbed onto the substrate and a residual portion of the first reactant material within the reaction chamber, thus forming a reacted material layer upon the substrate.

6. (Withdrawn) The method of claim 5 wherein the substrate is employed within a microelectronic product selected from the group consisting of integrated circuit products, ceramic substrate products and optoelectronic products.

7. (Original) The method of claim 5 wherein the deposition method employs a first pulsed reactant gas, a second pulsed reactant gas and a pulsed purge gas.

8. (withdrawn) The method of claim 5 wherein the deposition method employs a first pulsed reactant gas, a second pulsed reactant gas and a non-pulsed purge gas.

9. (withdrawn) The method of claim 5 wherein the minimum of two reactant materials are separately pulsed without overlapping.

10. (withdrawn) The method of claim 5 wherein the minimum of two reactant materials are separately pulsed with overlapping.

11. (withdrawn) The method of claim 5 wherein the microelectronic layer is selected from the group consisting of conductor layers, semiconductor layers and dielectric layers.

12. (withdrawn) The method of claim 5 wherein the microelectronic layer is a conductor barrier layer.

13. (withdrawn) The method of claim 12 wherein the conductor barrier layer is selected from the group consisting of nitrides of titanium, tantalum, tungsten, zirconium, hafnium, molybdenum and niobium.

14. (withdrawn) The method of claim 12 wherein the conductor barrier layer is employed as a capacitor plate layer within a microelectronic capacitor.

15. (Previously presented) A method for forming a microelectronic layer comprising:

providing a substrate;

forming over the substrate a microelectronic layer while employing a deposition method which employs a separately pulsed introduction of a minimum of two reactant materials introduced into a reactor chamber and separated by a reactor chamber purge, where the reactor chamber is maintained at a pressure of greater than about 500 mtorr;

where a second reactant material reacts with both a first reactant material adsorbed onto the substrate and a residual portion of the first reactant material within the reaction chamber, thus forming a reacted material layer upon the substrate.

16. (Original) The method of claim 15 wherein the deposition method employs a first pulsed reactant gas, a second pulsed reactant gas and a pulsed purge gas.

17. (withdrawn) The method of claim 15 wherein the deposition method employs a first pulsed reactant gas, a second pulsed reactant gas and a non-pulsed purge gas.

18. (withdrawn) The method of claim 15 wherein the microelectronic layer is selected from the group consisting of conductor layers, semiconductor layers and dielectric layers.

19. (withdrawn) The method of claim 15 wherein the microelectronic layer is a conductor barrier layer.

20. (Previously presented) A method for forming a microelectronic layer comprising:

providing a substrate;

forming over the substrate a microelectronic layer while employing a deposition method which employs a separately pulsed introduction of a minimum of two reactant materials introduced into a reactor chamber, where the reactor chamber is maintained at a pressure of greater than about 500 mtorr such as to provide an enhanced deposition rate of the microelectronic layer.

where a second reactant material reacts with both a first reactant material adsorbed onto the substrate and a residual portion of the first reactant material within the reaction chamber, thus forming a reacted material layer upon the substrate.

21. (Original) The method of claim 20 wherein the deposition method employs a first pulsed reactant gas, a second pulsed reactant gas and a pulsed purge gas.

22. (withdrawn) The method of claim 20 wherein the deposition method employs a first pulsed reactant gas, a second pulsed reactant gas and a non-pulsed purge gas.

23. (withdrawn) The method of claim 20 wherein the microelectronic layer is selected from the group consisting of conductor layers, semiconductor layers and dielectric layers.

24. (withdrawn) The method of claim 20 wherein the microelectronic layer is a conductor barrier layer.

REMARKS

This is a full and timely response to the outstanding Action mailed May 19, 2006. Claims 1-2 and 5-24 remain pending. However, claims 6, 8-14, 17-19, and 22-24 are withdrawn from consideration. In this response, no amendment is made in claims, drawing or specification. Applicant respectfully submits that claims 1-2 and 5-24 are clearly in condition for allowance for at least the reasons described below. Indeed, Applicant presents the following remarks in an effort to further point out distinctions to the Examiner at this time, in hopes of avoiding an unnecessary appeal process for this case. The accompanying remarks are necessary in light of the position taken in the Final Office Action. The remarks of the instant response further clarify and distinguish Applicant's claimed embodiments over the grounds of rejection and supporting reasoning presented in the Final Action.

102(e) rejections

Claims 1,2,5,7,15,16,20, 21 stand rejected under 35 U.S.C. 102(e) as allegedly anticipated by Chen et al. 6,916,398 B2. This rejection is respectfully traversed the rejection for the reasons as follow.

As set forth in Applicant's argument filed on 2/14/04, Chen et al teach delivering a first (second) reactant gas and a first (second) purge gas through a first (second) conduit. Significantly, there is no teaching of "the second reactant gas reacts with both the first reactant gas adsorbed onto the substrate and the residual portion of the first reactant gas," as specifically recited in independent claims 1, 5, 15, and 20. Chen et al. expressly teach away from the invention by preventing the reactant gases from mixing together.

The present Office Action states that this argument is not persuasive because Chen et al does disclose the mixing of gases. In fact, Chen et al specifically states "In one aspect, a pulse of tantalum containing compound may still be in the chamber when a pulse of the nitrogen compound enters" (see column 15 lines 38-40). In response, Applicant respectfully submits that the office action has misinterpreted the prior art. In this regard, Col. 15, 38-44 of Chen et al states:

> *In one aspect, a pulse of tantalum containing compound may still be in the chamber when a pulse of the nitrogen containing compounds enters. In general, the duration of the purge gas and/or pump evacuation should be long enough to prevent the pulse of the tantalum containing compound and the nitrogen containing compound from mixing together in the reaction zone.*

Accordingly, Chen et al clearly teaches that the fact that "the tantalum containing compound may still be in the chamber" is a problem, and the solution of this problem is "the duration of the purge and/or pump evacuation should be long enough **to prevent** the pulse of the tantalum containing compound and the nitrogen compound **from mixing together** in the reaction zone".

Indeed, Chen et al expressly and clearly teach away from the claimed embodiments. From the teaching of Chen et al, those skilled in the art would increase the duration of the purge and/or pump evacuation to prevent the tantalum containing residue; however, the invention requires the tantalum containing compound remains in the chamber when a pulse of the nitrogen compounds enters. Therefore, one of ordinary skill in the art would not have been motivated from the teaching of Chen et al (as a whole) to leave a residual reactant gas in the chamber to react with a succeeding reactant gas. As such, independent claims 1, 5, 15, 20 clearly define over the teachings of Chen et al.

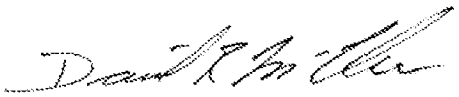
As the cited reference does not teach or suggest the feature as set forth in claims 1, 5, 15,

20, claims 1, 5, 15, 20 are allowable over the cited reference. Insofar as claims 2, 7, 16, 21 depend from claims 1, 5, 15, 20, respectively, these claims are also allowable at least by virtue of their dependency.

A prompt and favorable action on the merits of this application is now respectfully requested.

No fee is believed to be due in connection with this response to Final Office Action. If, however, any fee is deemed to be payable, you are hereby authorized to charge any such fee to Deposit Account No. 20-0778.

Respectfully submitted,

By: 

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